OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **THORNDIKE POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *worsening* in-lake chlorophyll-a trend, meaning concentrations are increasing. The mean chlorophyll concentration was above the New Hampshire mean reference line for the first time, and the August result was the highest Thorndike Pond has ever experienced. The August chlorophyll-a concentration indicates a possible algae bloom. Phosphorus concentrations in both the upper and lower water layers were high in August and could have contributed to excess algal growth. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. Overall, water clarity decreased from the 1999 season. June transparency was high due to the low chlorophyll concentration. Transparency in August was not affected by the spike in algal abundance and remained consistent with the July transparency value. The mean clarity was again below the state mean reference line. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stabilizing* trend for hypolimnetic phosphorus levels, but a *variable* trend for epilimnetic levels. The phosphorus concentration was elevated in both layers in August. It is possible that dissolved oxygen became depleted in the lower layer as the summer progressed, which then caused phosphorus bound to the sediments to be released into the water column. The mean epilimnetic phosphorus concentration was above the New Hampshire median. This has not happened since 1994, and as a result, the pond experienced a sharp increase in algal abundance, similar to results in 1994. The mean hypolimnetic concentration was below the state median. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- The mean conductivity level of the SW Inlet was decreased from the 1999 mean (Table 6), but continues to have the highest conductivity of the sites tested at Thorndike Pond. This inlet had low flow on at least one occasion this summer. If conductivity levels continue to increase, we suggest sampling at several sites along this inlet to determine any possible sources of pollutants.

- The average total phosphorus concentration at the SW Inlet was also reduced from last year (Table 8). However, the average continues to be in the high range for phosphorus in New Hampshire waters. Through continued sampling we can determine the sources of phosphorus to the lake.

- Dissolved oxygen was again high at all depths of the pond (Table 9). Shallow ponds tend to be continuously mixing by wind and wave action.

NOTES

- Monitor's Note (6/14/00): Three inches of rain in past week.

- Monitor's Note (7/17/00): SW Inlet barely flowing. NW Inlet flowing but not fast.

- Monitor's Note (8/14/00): Both Inlets flowing well.

USEFUL RESOURCES

Low Impact Boating, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

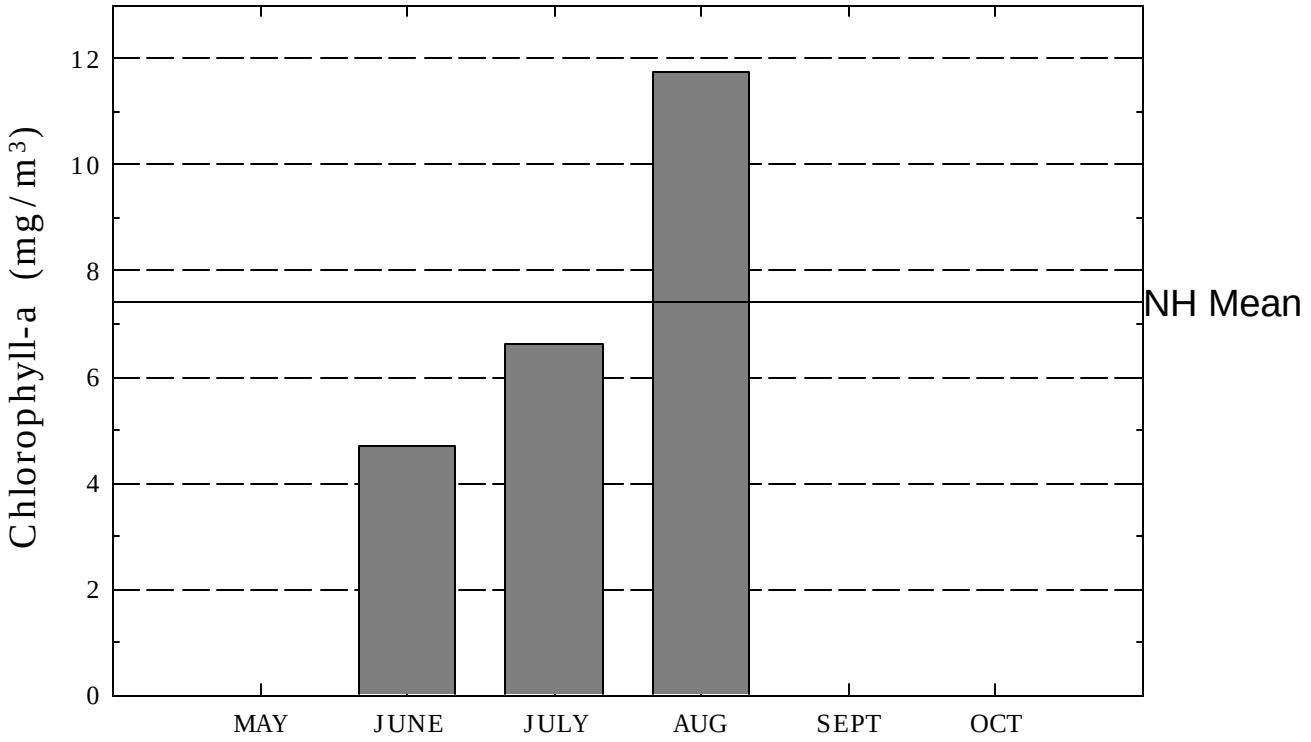
Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

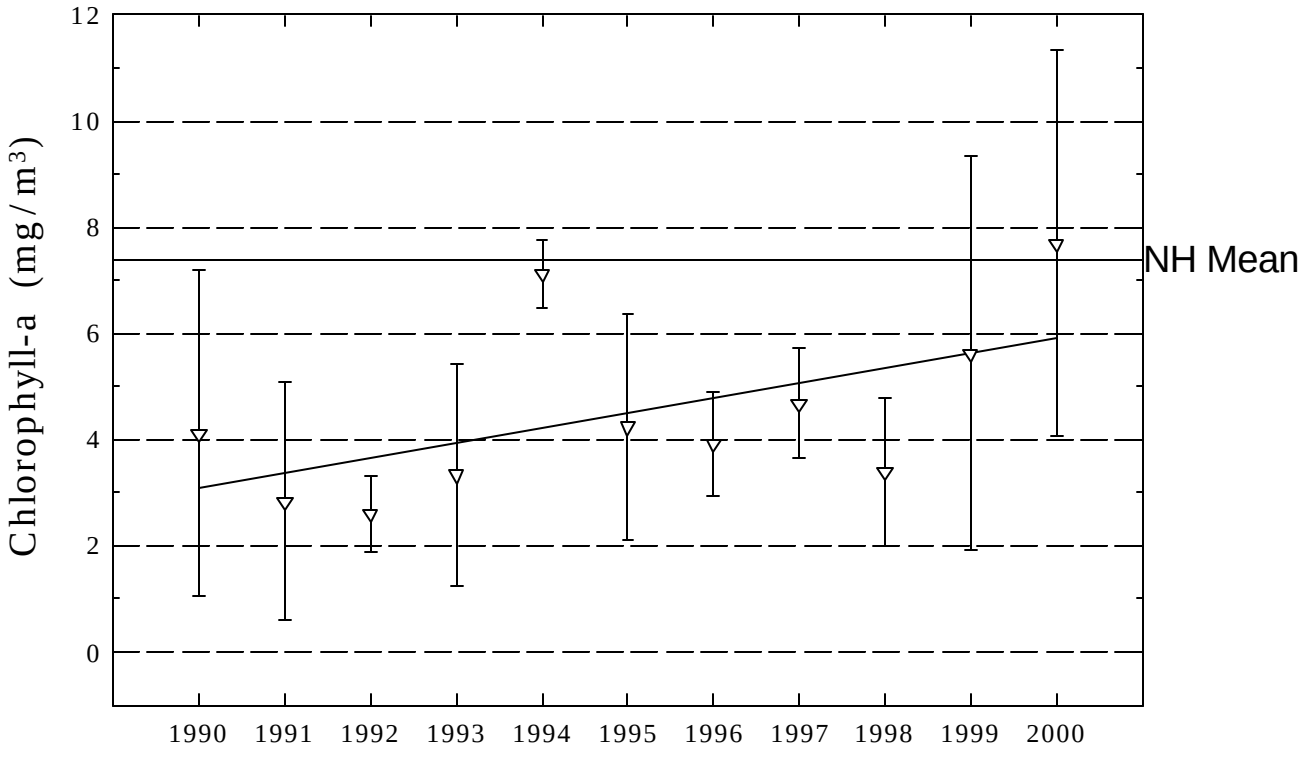
The Wetlands Resource, WD-WB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Thorndike Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



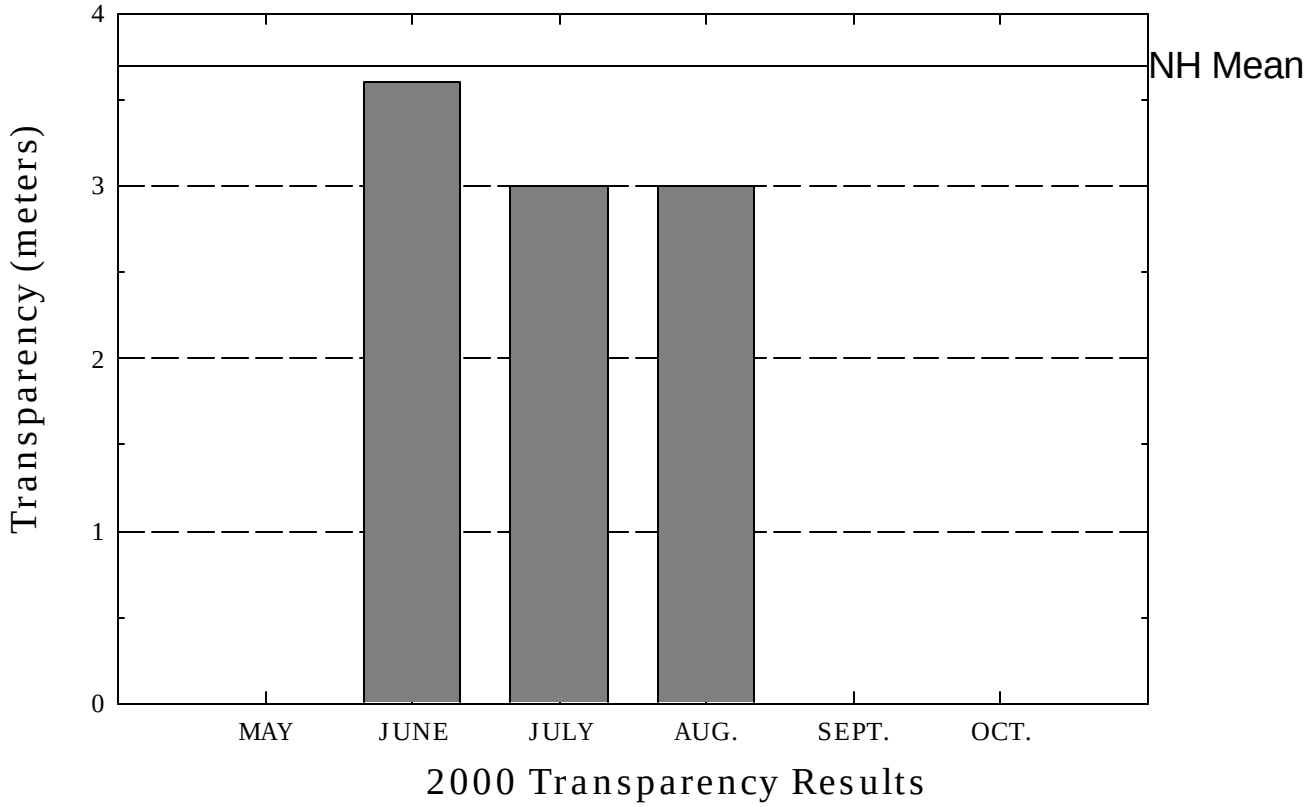
2000 Chlorophyll-a Results

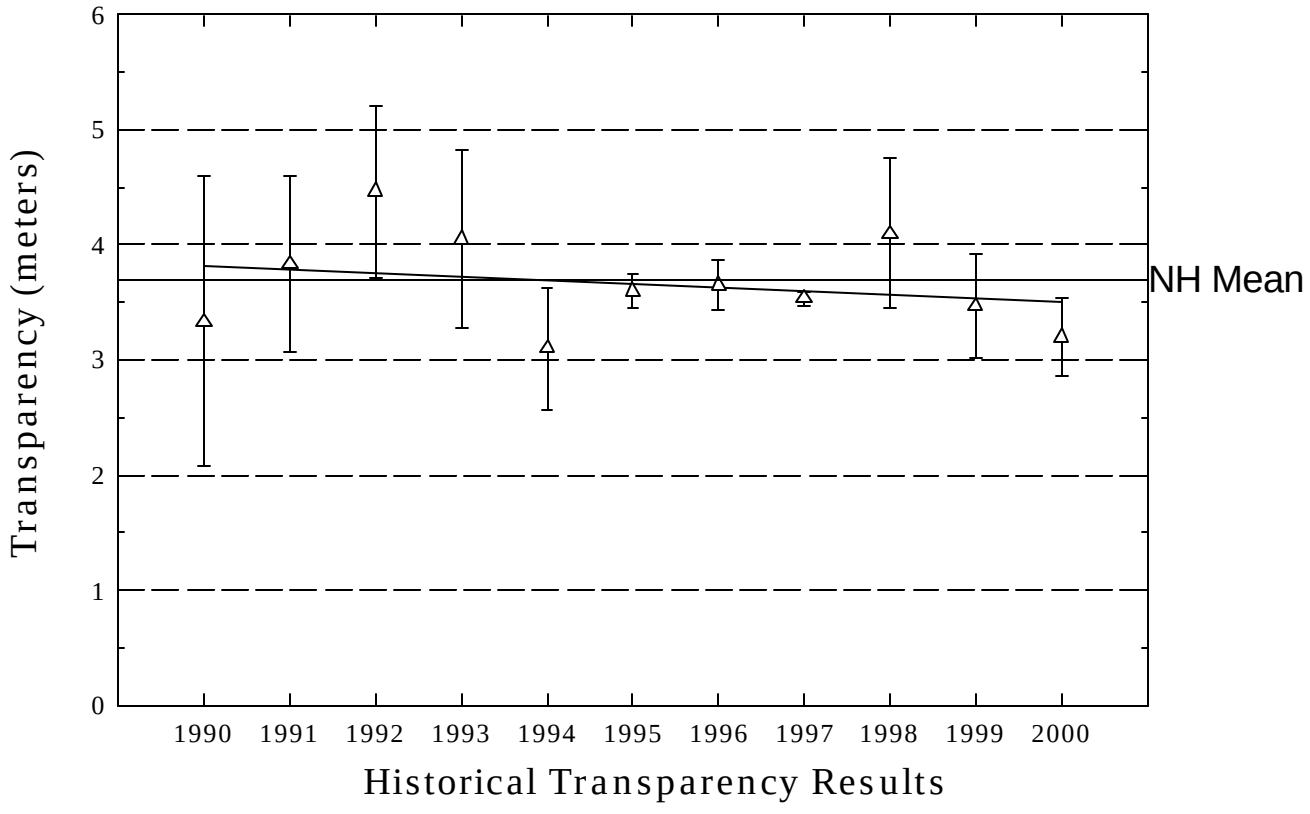


Historical Chlorophyll-a Results

Thorndike Pond

Figure 2. Monthly and Historical Transparency Results





Thorndike Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

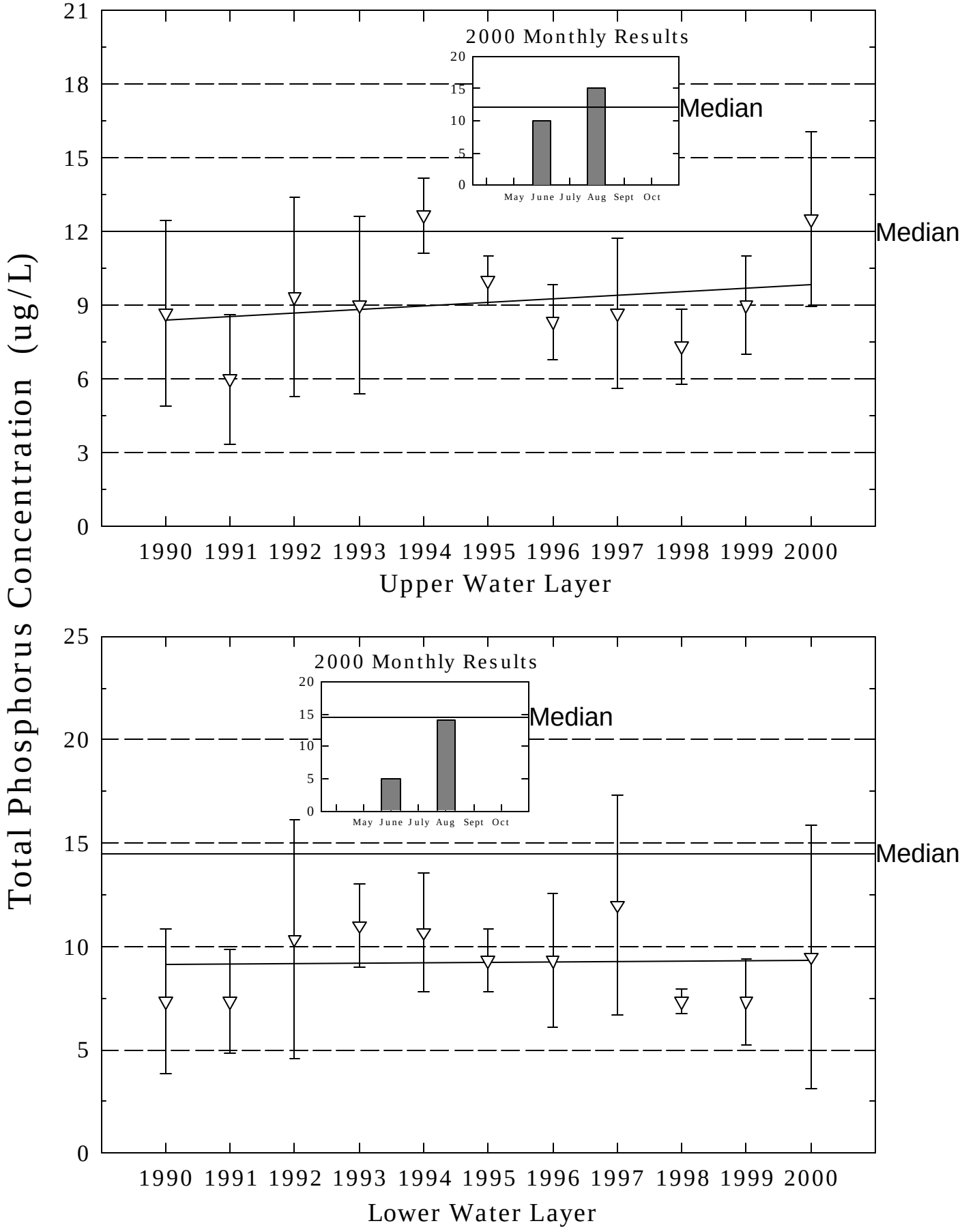


Table 1.

THORNDIKE POND

JAFFREY

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1990	1.97	7.63	4.11
1991	0.90	5.30	2.83
1992	1.82	3.27	2.59
1993	1.50	5.62	3.33
1994	6.59	7.85	7.12
1995	1.78	5.64	4.24
1996	2.79	4.53	3.91
1997	3.82	5.83	4.68
1998	1.85	4.58	3.79
1999	2.56	9.74	5.62
2000	4.72	11.74	7.69

Table 2.

THORNDIKE POND

JAFFREY

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06/14/1990	DINOBRYON	86
07/22/1991	DINOBRYON	53
	ASTERIONELLA	35
06/17/1992	CHRYSOSPHAERELLA	62
	DINOBRYON	20
	ASTERIONELLA	6
06/17/1993	CHRYSOSPHAERELLA	35
	ANABAENA	21
	UROGLENOPSIS	20
06/29/1994	RHIZOSOLENIA	23
	ASTERIONELLA	20
	TABELLARIA	20
05/31/1995	CHRYSOSPHAERELLA	38
	DINOBRYON	25
	TABELLARIA	17
07/20/1995	ASTERIONELLA	32
	DINOBRYON	26
	CHRYSOSPHAERELLA	21
05/14/1996	DINOBRYON	82
	RHIZOSOLENIA	8
	TABELLARIA	4
06/18/1997	CHRYSOSPHAERELLA	81
	DINOBRYON	9
	TABELLARIA	4
06/10/1998	CHRYSOSPHAERELLA	81
	TABELLARIA	12
	MELOSIRA	1
07/20/1998	CHRYSOSPHAERELLA	35
	DINOBRYON	30
	SYNURA	12

Table 2.

THORNDIKE POND

JAFFREY

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/20/1998	CHRYSOSPHAERELLA	35
	DINOBRYON	30
	SYNURA	12
06/16/1999	CHRYSOSPHAERELLA	68
	DINOBRYON	12
	ASTERIONELLA	6
06/14/2000	ASTERIONELLA	45
	DINOBRYON	32
	SYNURA	8

Table 3.

THORNDIKE POND

JAFFREY

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1990	2.0	4.5	3.3
1991	3.0	4.5	3.8
1992	3.7	5.2	4.4
1993	3.5	5.0	4.3
1994	2.5	3.5	3.1
1995	3.5	5.2	4.1
1996	3.5	4.0	3.7
1997	3.5	3.6	3.5
1998	3.5	4.8	3.8
1999	3.0	3.9	3.4
2000	3.0	3.6	3.2

Table 4.

THORNDIKE POND

JAFFREY

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1990	6.54	6.75	6.61
	1991	6.60	6.76	6.69
	1992	6.63	6.74	6.69
	1993	6.30	6.76	6.54
	1994	6.57	6.77	6.68
	1995	6.56	6.75	6.67
	1996	6.16	6.51	6.28
	1997	6.25	6.67	6.48
	1998	6.36	6.76	6.50
	1999	6.29	6.50	6.38
	2000	6.32	6.48	6.41
HYPOLIMNION				
	1990	6.27	6.65	6.45
	1991	6.39	6.90	6.59
	1992	6.53	6.81	6.62
	1993	6.43	6.80	6.63
	1994	6.38	6.74	6.51
	1995	6.37	6.80	6.53
	1996	5.89	6.41	6.03
	1997	6.02	6.76	6.33
	1998	5.64	6.20	5.92
	1999	6.28	6.60	6.37
	2000	6.07	6.28	6.15

Table 4.

THORNDIKE POND

JAFFREY

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
METALIMNION				
	1993	6.66	6.69	6.67
	1995	6.41	6.41	6.41
NW INLET				
	1990	6.22	6.41	6.27
	1991	6.57	6.57	6.57
	1995	6.04	6.34	6.16
	1996	5.68	5.87	5.76
	1997	5.99	5.99	5.99
	1998	5.88	6.08	5.97
	2000	5.56	5.96	5.76
OUTLET				
	1990	6.53	6.64	6.58
	1991	6.45	6.72	6.58
	1992	6.60	6.87	6.70
	1993	6.41	6.41	6.41
	1994	6.45	6.84	6.60
	1995	6.39	6.68	6.53
	1996	5.96	6.37	6.13
	1997	6.19	6.53	6.36
	1998	5.19	6.43	5.62
	1999	6.39	6.50	6.45
	2000	6.09	6.38	6.26

Table 4.

THORNDIKE POND

JAFFREY

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
SW INLET				
	1990	5.96	6.63	6.27
	1991	6.63	6.63	6.63
	1994	6.12	6.12	6.12
	1995	6.16	6.25	6.20
	1996	5.46	5.93	5.63
	1997	5.58	6.03	5.75
	1998	5.71	5.94	5.81
	2000	5.49	5.88	5.70

Table 5.

THORNDIKE POND

JAFFREY

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1990	2.20	3.20	2.80
1991	2.60	2.90	2.73
1992	2.30	3.40	3.03
1993	1.60	3.30	2.63
1994	2.50	3.10	2.83
1995	1.70	2.70	2.30
1996	1.70	2.40	2.13
1997	1.50	2.30	1.93
1998	1.50	2.10	1.78
1999	2.40	2.70	2.55
2000	2.10	2.50	2.33

Table 6.

THORNDIKE POND

JAFFREY

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1990	35.0	36.6	35.7
	1991	32.3	34.2	33.4
	1992	34.2	36.0	34.9
	1993	34.7	38.8	36.9
	1994	33.6	38.5	36.4
	1995	34.9	37.8	36.7
	1996	31.7	35.7	34.0
	1997	31.7	32.6	32.1
	1998	27.7	32.0	29.2
	1999	33.9	34.9	34.3
	2000	32.1	33.1	32.5
HYPOLIMNION				
	1990	34.8	41.7	37.6
	1991	32.2	34.3	33.5
	1992	34.2	35.4	34.7
	1993	36.1	38.2	37.2
	1994	33.7	38.6	36.9
	1995	34.7	38.9	36.8
	1996	31.5	35.9	34.0
	1997	31.3	32.6	31.8
	1998	24.8	31.9	28.4
	1999	34.2	34.6	34.3
	2000	32.0	33.4	32.5

Table 6.

THORNDIKE POND

JAFFREY

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
METALIMNION				
	1993	37.2	38.6	37.9
	1995	35.2	35.2	35.2
NW INLET				
	1990	32.9	34.8	33.9
	1991	33.7	33.7	33.7
	1995	25.6	36.6	31.1
	1996	21.5	27.2	24.3
	1997	30.1	30.1	30.1
	1998	19.7	22.1	20.9
	2000	19.9	23.7	21.5
OUTLET				
	1990	34.4	36.8	35.6
	1991	32.4	34.5	33.5
	1992	34.4	35.3	34.9
	1993	35.7	35.7	35.7
	1994	36.9	38.6	37.7
	1995	34.7	37.5	36.3
	1996	31.7	136.5	67.7
	1997	31.7	32.7	32.0
	1998	29.3	32.0	30.2
	1999	33.6	38.3	35.4
	2000	32.1	33.0	32.6
SW INLET				
	1990	37.3	122.0	65.8

Table 6.

THORNDIKE POND

JAFFREY

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1991	35.9	35.9	35.9
	1994	142.6	142.6	142.6
	1995	54.9	118.7	86.8
	1996	70.6	142.6	106.6
	1997	131.7	131.8	131.7
	1998	100.2	120.2	110.2
	2000	97.2	121.5	105.4

Table 8.

THORNDIKE POND

JAFFREY

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
BANKER COVE				
	1996	1	1	1
BROWN COVE				
	1996	7	7	7
EPILIMNION				
	1990	6	13	8
	1991	4	9	6
	1992	7	14	9
	1993	6	13	9
	1994	11	14	12
	1995	9	11	10
	1996	7	10	8
	1997	6	12	8
	1998	6	9	7
	1999	7	11	9
	2000	10	15	12
HAMPSEY AREA				
	1996	6	6	6
HYPOLIMNION				
	1990	4	11	7
	1991	5	10	7
	1992	7	17	10
	1993	9	13	11
	1994	9	14	10
	1995	8	11	9

Table 8.

THORNDIKE POND

JAFFREY

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1996	7	13	9
	1997	8	18	12
	1998	7	9	7
	1999	5	9	7
	2000	5	14	9
KARLSBERGER				
	1996	8	8	8
METALIMNION				
	1993	6	13	9
	1995	12	12	12
NW INLET				
	1990	10	13	11
	1991	9	9	9
	1995	10	13	11
	1996	7	19	13
	1997	13	13	13
	1998	6	9	7
	2000	5	13	9
OUTLET				
	1990	1	8	5
	1991	5	7	6
	1992	7	8	7
	1993	7	7	7
	1994	9	13	11
	1995	10	12	11
	1996	8	10	9

Table 8.

THORNDIKE POND

JAFFREY

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1997	8	15	11
	1998	2	7	5
	1999	4	8	5
	2000	10	15	12
PT RD COVE 2M				
	1995	13	13	13
SOUTH 3M				
	1995	12	12	12
SW A				
	1996	10	10	10
SW B				
	1996	9	9	9
SW C				
	1996	8	8	8
SW D				
	1996	27	27	27
SW INLET				
	1990	1	9	6
	1991	9	9	9
	1994	58	58	58
	1995	35	44	39
	1996	4	56	30
	1997	34	112	73
	1998	31	47	39
	2000	18	42	30

Table 9.

THORNDIKE POND

JAFFREY

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		June 14, 2000	
0.1	17.2	8.5	88.6
1.0	17.2	8.4	87.7
2.0	17.2	8.4	87.6
3.0	17.2	8.4	87.3
4.0	17.2	8.3	86.0
5.0	16.3	7.2	73.9
5.5	16.0	5.5	55.3

Table 10.

THORNDIKE POND

JAFFREY

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 14, 1990	5.5	18.0	9.2	97.6
July 22, 1991	5.5	22.1	4.6	53.0
June 16, 1992	5.5	18.0	11.1	117.8
June 17, 1993	5.0	19.0	9.5	101.0
June 29, 1994	5.0	21.9	7.0	76.0
May 31, 1995	5.0	17.2	9.6	98.0
July 20, 1995	5.0	21.9	8.0	90.0
May 14, 1996	5.0	10.5	10.2	90.0
June 18, 1997	5.0	19.2	8.0	86.0
June 10, 1998	5.0	16.6	9.3	93.0
July 20, 1998	5.0	18.2	2.1	22.0
June 16, 1999	5.0	21.9	7.6	86.4
June 14, 2000	5.5	16.0	5.5	55.3

Table 11.

THORNDIKE POND

JAFFREY

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1993	0.0	0.0	0.0
	1997	0.5	0.6	0.5
	1998	0.3	0.5	0.4
	1999	0.5	0.8	0.7
	2000	0.4	0.5	0.5
HYPOLIMNION				
	1993	0.0	0.0	0.0
	1997	0.5	0.7	0.6
	1998	0.6	0.8	0.7
	1999	0.4	0.9	0.7
	2000	0.5	0.6	0.5
METALIMNION				
	1993	0.0	0.0	0.0
NW INLET				
	1997	1.4	1.4	1.4
	1998	0.4	0.6	0.5
	2000	0.3	0.6	0.4
OUTLET				
	1997	0.4	0.6	0.5
	1998	0.3	0.5	0.4
	1999	0.7	1.3	1.0
	2000	0.5	0.6	0.5
SW INLET				
	1997	1.0	5.7	3.3
	1998	1.7	2.5	2.1

Table 11.

THORNDIKE POND

JAFFREY

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	2000	1.0	1.6	1.4